

What is claimed is:

1. A diaphragm type load detection sensor comprising:
a mounting portion attached to a installation plate;
a strain generation portion provided on the mounting portion and having
5 a load applied portion formed at the center thereof to which a load to be
detected is applied; and

a strain gauge provided on the strain generation portion, wherein
said strain gauge has sensing elements evenly provided on substantially
whole periphery thereof and positioned at the predetermined distances from
10 the center axis of the load applied portion of the strain generation portion.

2. A diaphragm type load detection sensor according to claim 1 in which
a projection is formed on the load applied portion at the center axis thereof
and said sensing elements are provided on a surface of the strain generation
portion at such side that is opposite to the side where said projection is
15 formed.

3. A diaphragm type load detection sensor according to claim 1 in which
said sensing elements have a pattern wherein the sensing element is disposed
to receive a strain in the peripheral direction and a pattern wherein the
sensing element is disposed to receive a strain in the radial direction.

20 4. A diaphragm type load detection sensor according to claim 2 in which
said sensing elements have a pattern wherein the sensing element is disposed
to receive a strain in the peripheral direction and a pattern wherein the
sensing element is disposed to receive a strain in the radial direction.

5. A diaphragm type load detection sensor according to any one of claims
25 1 to 4 in which said strain gauge has terminals provided outside of the sensing
elements and is disposed on the strain generation portion in such manner that
said sensing elements are positioned on the strain generation portion and said
terminals are positioned on the mounting portion.

6. A diaphragm type load detection sensor according to any one of claims 1 to 4 in which said mounting portion is attached to the installation plate with a flexible resilient member interposed therebetween.

5 7. A diaphragm type load detection sensor according to claim 5 in which said mounting portion is attached to the installation plate with a flexible resilient member interposed therebetween.

8. A diaphragm type load detection sensor according to claim 6 in which said flexible resilient member is formed from rubber material.

10 9. A diaphragm type load detection sensor according to claim 7 in which said flexible resilient member is formed from rubber material.

10. A diaphragm type load detection sensor according to claim 6 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

15 11. A diaphragm type load detection sensor according to claim 7 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

20 12. A diaphragm type load detection sensor according to claim 8 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

25 13. A diaphragm type load detection sensor according to claim 9 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

14. A load detection unit comprising:
a diaphragm type load detection sensor;

a case;

a transmission assembly; and

a support member, wherein

5 said diaphragm type load detection sensor has a mounting portion, a strain generation portion provided on the mounting portion and having a load applied portion formed at the center thereof to which a load to be detected is applied, and a strain gauge provided on the strain generation portion;

 said case is attached to an installation plate for guiding the diaphragm type load detection sensor;

10 said transmission assembly transmits a load to be detected to the load applied portion of the diaphragm type load detection sensor;

 said support member supports the transmission assembly on the case; and

15 said strain gauge has sensing elements evenly provided on substantially whole periphery thereof and positioned at the predetermined distances from the center axis of the load applied portion of the strain generation portion.

15. A load detection unit according to claim 14 in which a projection is formed on the load applied portion at the center axis thereof and said sensing elements are provided on a surface of the strain generation portion at such
20 side that is opposite to the side where said projection is formed.

16. A load detection unit according to claim 14 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element is disposed to receive a strain in the radial direction.

25 17. A load detection unit according to claim 15 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element is disposed to receive a strain in the radial direction.

18. A load detection unit according to any one of claims 14 to 17 in which said strain gauge has terminals provided outside of the sensing elements and is disposed on the strain generation portion in such manner that said sensing elements are positioned on the strain generation portion and said terminals
5 are positioned on the mounting portion.

19. A load detection unit according to any one of claims 14 to 17 in which it further comprises at least one of a flexible resilient member contained in the case and interposed between the mounting portion of the diaphragm type load detection sensor and the installation plate, or another flexible resilient
10 member provided at such side of the transmission assembly that receives a load to be detected.

20. A load detection unit according to claim 18 in which it further comprises at least one of a flexible resilient member contained in the case and interposed between the mounting portion of the diaphragm type load
15 detection sensor and the installation plate, or another flexible resilient member provided at such side of the transmission assembly that receives a load to be detected.

21. A load detection unit according to claim 19 in which said at least one of the flexible resilient member or another flexible resilient member is formed
20 from rubber material.

22. A load detection unit according to claim 20 in which said at least one of the flexible resilient member or another flexible resilient member is formed from rubber material.

23. A load detection unit according to any one of claims 14 to 17 in which
25 said transmission assembly is coupled to the load applied portion with freedom.

24. A load detection unit according to claim 18 in which said transmission assembly is coupled to the load applied portion with freedom.

25. A load detection unit according to claim 19 in which said transmission assembly is coupled to the load applied portion with freedom.

26. A load detection unit according to claim 20 in which said transmission assembly is coupled to the load applied portion with freedom.

5 27. A load detection unit according to claim 21 in which said transmission assembly is coupled to the load applied portion with freedom.

28. A load detection unit according to claim 22 in which said transmission assembly is coupled to the load applied portion with freedom.

29. A load detection unit according to any one of claims 14 to 17 in which
10 said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

30. A load detection unit according to claim 18 in which said support member is a leaf spring including an outer peripheral strip permanently
15 coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

31. A load detection unit according to claim 19 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the
20 transmission assembly, and flexible strips for coupling therebetween.

32. A load detection unit according to claim 20 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

25 33. A load detection unit according to claim 21 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

34. A load detection unit according to claim 22 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

5 35. A load detection unit according to claim 23 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

10 36. A load detection unit according to claim 24 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

15 37. A load detection unit according to claim 25 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

20 38. A load detection unit according to claim 26 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

39. A load detection unit according to claim 27 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

25 40. A load detection unit according to claim 28 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

41. A load detection unit according to claim 30 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

5 42. A load detection unit according to claim 31 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

43. A load detection unit according to claim 32 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

10 44. A load detection unit according to claim 33 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

15 45. A load detection unit according to claim 34 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

46. A load detection unit according to claim 35 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

20 47. A load detection unit according to claim 36 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

48. A load detection unit according to claim 37 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

25 49. A load detection unit according to claim 38 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

50. A load detection unit according to claim 39 in which said flexible

strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

51. A load detection unit according to claim 40 in which said flexible strips are plural beams formed in the direction of rotation about the center
5 axis of the inner peripheral strip.

52. An electronic scale comprising:

a diaphragm type load detection sensor;

a base;

a platform; and

10 a lever, wherein

said diaphragm type load detection sensor comprises: a mounting portion attached to a installation plate; a strain generation portion provided on the mounting portion and having a load applied portion formed at the center thereof to which a load to be detected is applied; and a strain gauge
15 provided on the strain generation portion, wherein said strain gauge has sensing elements evenly provided on substantially whole periphery thereof and positioned at the predetermined distances from the center axis of the load applied portion of the strain generation portion, and

said lever receives load applied to the platform and transmits it to the
20 load applied portion of the diaphragm type load detection sensor.

53. An electronic scale according to claim 52 in which a projection is formed on the load applied portion at the center axis thereof and said sensing elements are provided on a surface of the strain generation portion at such side that is opposite to the side where said projection is formed.

25 54. An electronic scale according to claim 52 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element is disposed to receive a strain in the radial direction.

55. An electronic scale according to claim 53 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element is disposed to receive a strain in the radial direction.

5 56. An electronic scale according to any one of claims 52 to 55 in which said strain gauge has terminals provided outside of the sensing elements and is disposed on the strain generation portion in such manner that said sensing elements are positioned on the strain generation portion and said terminals are positioned on the mounting portion.

10 57. An electronic scale according to any one of claims 52 to 55 in which said mounting portion is attached to the installation plate with a flexible resilient member interposed therebetween.

 58. An electronic scale according to claim 56 in which said mounting portion is attached to the installation plate with a flexible resilient member
15 interposed therebetween.

 59. An electronic scale according to claim 57 in which said flexible resilient member is formed from rubber material.

 60. An electronic scale according to claim 58 in which said flexible resilient member is formed from rubber material.

20 61. An electronic scale according to claim 57 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

 62. An electronic scale according to claim 58 in which said flexible
25 resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

 63. An electronic scale according to claim 59 in which said flexible

resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

5 64. An electronic scale according to claim 60 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

65. An electronic scale comprising:
a diaphragm type load detection sensor;
10 a base; and
a platform, wherein

said diaphragm type load detection sensor comprises: a mounting portion attached to a installation plate; a strain generation portion provided on the mounting portion and having a load applied portion formed at the center thereof to which a load to be detected is applied; and a strain gauge
15 provided on the strain generation portion, wherein said strain gauge has sensing elements evenly provided on substantially whole periphery thereof and positioned at the predetermined distances from the center axis of the load applied portion of the strain generation portion, and

20 said platform is coupled to the load applied portion of the diaphragm type load detection sensor.

66. An electronic scale according to claim 65 in which a projection is formed on the load applied portion at the center axis thereof and said sensing elements are provided on a surface of the strain generation portion at such
25 side that is opposite to the side where said projection is formed.

67. An electronic scale according to claim 65 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element

is disposed to receive a strain in the radial direction.

68. An electronic scale according to claim 66 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element
5 is disposed to receive a strain in the radial direction.

69. An electronic scale according to any one of claims 65 to 68 in which said strain gauge has terminals provided outside of the sensing elements and is disposed on the strain generation portion in such manner that said sensing elements are positioned on the strain generation portion and said terminals
10 are positioned on the mounting portion.

70. An electronic scale according to any one of claims 65 to 68 in which said mounting portion is attached to the installation plate with a flexible resilient member interposed therebetween.

71. An electronic scale according to claim 69 in which said mounting
15 portion is attached to the installation plate with a flexible resilient member interposed therebetween.

72. An electronic scale according to claim 70 in which said flexible resilient member is formed from rubber material.

73. An electronic scale according to claim 71 in which said flexible
20 resilient member is formed from rubber material.

74. An electronic scale according to claim 70 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

25 75. An electronic scale according to claim 71 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

76. An electronic scale according to claim 72 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

5 77. An electronic scale according to claim 73 in which said flexible resilient member is secured to the mounting portion or the installation plate with an adhesion means, an adhesive agent, a fastening screw, a guide member, a mating connection or an integral molding process.

78. An electronic scale using a load detection unit comprising:

10 a diaphragm type load detection sensor;
 a case;
 a transmission assembly; and
 a support member, wherein

15 said diaphragm type load detection sensor has a mounting portion, a strain generation portion provided on the mounting portion and having a load applied portion formed at the center thereof to which a load to be detected is applied, and a strain gauge provided on the strain generation portion;

 said case is attached to an installation plate for guiding the diaphragm type load detection sensor;

20 said transmission assembly transmits a load to be detected to the load applied portion of the diaphragm type load detection sensor;

 said support member supports the transmission assembly on the case;
and

25 said strain gauge has sensing elements evenly provided on substantially whole periphery thereof and positioned at the predetermined distances from the center axis of the load applied portion of the strain generation portion.

79. An electronic scale using a load detection unit according to claim 78 in which a projection is formed on the load applied portion at the center axis

thereof and said sensing elements are provided on a surface of the strain generation portion at such side that is opposite to the side where said projection is formed.

80. An electronic scale using a load detection unit according to claim 78
5 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element is disposed to receive a strain in the radial direction.

81. An electronic scale using a load detection unit according to claim 79
10 in which said sensing elements have a pattern wherein the sensing element is disposed to receive a strain in the peripheral direction and a pattern wherein the sensing element is disposed to receive a strain in the radial direction.

82. An electronic scale using a load detection unit according to any one of claims 78 to 81 in which said strain gauge has terminals provided outside of the sensing elements and is disposed on the strain generation portion in such
15 manner that said sensing elements are positioned on the strain generation portion and said terminals are positioned on the mounting portion.

83. An electronic scale using a load detection unit according to any one of claims 78 to 81 in which it further comprises at least one of a flexible resilient member contained in the case and interposed between the mounting portion
20 of the diaphragm type load detection sensor and the installation plate, or another flexible resilient member provided at such side of the transmission assembly that receives a load to be detected.

84. An electronic scale using a load detection unit according to claim 82
25 in which it further comprises at least one of a flexible resilient member contained in the case and interposed between the mounting portion of the diaphragm type load detection sensor and the installation plate, or another flexible resilient member provided at such side of the transmission assembly that receives a load to be detected.

85. An electronic scale using a load detection unit according to claim 83 in which said at least one of the flexible resilient member or another flexible resilient member is formed from rubber material.

86. An electronic scale using a load detection unit according to claim 84
5 in which said at least one of the flexible resilient member or another flexible resilient member is formed from rubber material.

87. An electronic scale using a load detection unit according to any one of claims 78 to 81 in which said transmission assembly is coupled to the load applied portion with freedom.

10 88. An electronic scale using a load detection unit according to claim 82 in which said transmission assembly is coupled to the load applied portion with freedom.

89. An electronic scale using a load detection unit according to claim 83 in which said transmission assembly is coupled to the load applied portion
15 with freedom.

90. An electronic scale using a load detection unit according to claim 84 in which said transmission assembly is coupled to the load applied portion with freedom.

91. An electronic scale using a load detection unit according to claim 85
20 in which said transmission assembly is coupled to the load applied portion with freedom.

92. An electronic scale using a load detection unit according to claim 86 in which said transmission assembly is coupled to the load applied portion with freedom.

25 93. An electronic scale using a load detection unit according to any one of claims 78 to 81 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for

coupling therebetween.

94. An electronic scale using a load detection unit according to claim 82 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled
5 to the transmission assembly, and flexible strips for coupling therebetween.

95. An electronic scale using a load detection unit according to claim 83 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

10 96. An electronic scale using a load detection unit according to claim 84 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

15 97. An electronic scale using a load detection unit according to claim 85 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

20 98. An electronic scale using a load detection unit according to claim 86 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

25 99. An electronic scale using a load detection unit according to claim 87 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled to the transmission assembly, and flexible strips for coupling therebetween.

100. An electronic scale using a load detection unit according to claim 88 in which said support member is a leaf spring including an outer peripheral strip permanently coupled to the case, an inner peripheral strip freely coupled

to the transmission assembly, and flexible strips for coupling therebetween.

101. An electronic scale using a load detection unit according to claim 89
in which said support member is a leaf spring including an outer peripheral
strip permanently coupled to the case, an inner peripheral strip freely coupled
5 to the transmission assembly, and flexible strips for coupling therebetween.

102. An electronic scale using a load detection unit according to claim 90
in which said support member is a leaf spring including an outer peripheral
strip permanently coupled to the case, an inner peripheral strip freely coupled
to the transmission assembly, and flexible strips for coupling therebetween.

10 103. An electronic scale using a load detection unit according to claim 91
in which said support member is a leaf spring including an outer peripheral
strip permanently coupled to the case, an inner peripheral strip freely coupled
to the transmission assembly, and flexible strips for coupling therebetween.

104. An electronic scale using a load detection unit according to claim 92
15 in which said support member is a leaf spring including an outer peripheral
strip permanently coupled to the case, an inner peripheral strip freely coupled
to the transmission assembly, and flexible strips for coupling therebetween.

105. An electronic scale using a load detection unit according to claim 94
in which said flexible strips are plural beams formed in the direction of
20 rotation about the center axis of the inner peripheral strip.

106. An electronic scale using a load detection unit according to claim 95
in which said flexible strips are plural beams formed in the direction of
rotation about the center axis of the inner peripheral strip.

107. An electronic scale using a load detection unit according to claim 96
25 in which said flexible strips are plural beams formed in the direction of
rotation about the center axis of the inner peripheral strip.

108. An electronic scale using a load detection unit according to claim 97
in which said flexible strips are plural beams formed in the direction of

rotation about the center axis of the inner peripheral strip.

109. An electronic scale using a load detection unit according to claim 98 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

5 110. An electronic scale using a load detection unit according to claim 99 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

111. An electronic scale using a load detection unit according to claim 100 in which said flexible strips are plural beams formed in the direction of
10 rotation about the center axis of the inner peripheral strip.

112. An electronic scale using a load detection unit according to claim 101 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

113. An electronic scale using a load detection unit according to claim
15 102 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

114. An electronic scale using a load detection unit according to claim 103 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.

20 115. An electronic scale using a load detection unit according to claim 104 in which said flexible strips are plural beams formed in the direction of rotation about the center axis of the inner peripheral strip.